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New Development of BIRD model

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The possibility that the flow of electrons emitted by a cathode at high dc voltage is essentially due to local emission of a covering dielectric layer is at the basis of the BIRD (Breakdown Induced by Rupture of Dielectric) model. This model assumes that, in presence of sufficient electric field, the electrons trapped in polarization structures of the dielectric layer are extracted by quantum tunneling effect. As a consequence of the layer electron depletion, the electric field inside the dielectric layer increases and the rupture (breakdown) of the layer itself can occur, provided certain conditions are met. To investigate experimentally the features of this model the High Voltage Short Gap Test Facility (HVSGTF) has recently been built in Padua. The experimental dark current measured at different electrode configurations permits us to test the correctness of the model predictions. In particular, we consider the trend of the current as a function of time and its dependence on the characteristic properties of the dielectric layer. From the theoretical side, we investigate the consistency between a semi-classical model and a simple quantum model.

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